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ABSTRACT

Computer awareness and literacy programs for gifted and talented high school students were developed at two Washington City Schools (North Carolina). At Carteret High School, a variety of computer programs were purchased for biology and physics studies, trigonometry and algebra studies, aptitude and merit exam preparation, basic skills math review, and simulations of space travel and a nuclear reactor melt-down. At Washington High School, an introductory experience with microcomputers was developed that covered historical developments, digital computer design, and computer languages. Additionally, students were taught to use a microcomputer, elementary programming techniques, and the use of loops and subroutines. Class activities included field trips to observe some computer operations. The course was found to be effective under specific conditions, including that students have free access to equipment and that there be structured evaluations. Also included are: a sample program of the final exam; a list of introductory materials and the publisher/distributors; a list of multi-media kits and programs written and stored on a tape cassette or electromagnetic disc and the distributors; a list of magazines and periodicals; and a list of the names and addresses of sources of information on computer equipment, courseware, or curricula. (SEW)

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[North Carolina Gifted and Talented Minigrant Curriculum Projects: Two Microcomputer Projects]

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EC 151638

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Ronald Parrish

DISPENSATION OF MINI-GRANT FUNDS

In accordance with the original guidelines of the Mini Grant submitted by East Carteret High School, the funds were used to purchase a variety of computer software. This software was concentrated in the academic areas of math and science to be utilized as supplementary and enrichment. Materials within the existing math curriculum programs were purchased for Advanced Math, Trigonometry, Algebra, Analytic Geometry and General Mathematics.

The Program Function Graphs and Transformations by Professor Don Stone (Powersoft, Inc., 1979) uses high resolution graphics to draw detailed graphs of functions to allow students to easily check for maximum, minimum, inflection and critical points.

The MECC disks have many good math and science programs. We purchased the Science (Vol. II, Version 3.0) and the Aestheometry (Vol. I, Version 2.2). The science disk has programs for use in Biology and Physics. Among these programs are ICBM, a radar tracking program. Aestheometry (Vol. I, Version 2.2) have several programs utilized in Trigonometry and Algebra courses. Aestheometry consists of two programs using two and three dimensional graphics to develop the concepts of the hyperbola, parabolas, circle and ellipses and their relationships to the acute, right and obtuse angles concepts of plane geometry.

The PDI program, Number Series (1978) is designed to increase the student's ability to recognize series of the types commonly found on standardized tests. The final program tests the student's abilities. The programs are used for students in preparation for SAT and National Merit Exams.

The Educational Activities, Inc. programs, Basic Math Competency Skills Drills, by Michael P. Conlon (1980, 3 disk series)

are being used within several math classes to maintain and review basic skills. They are also used in In-School Suspension. These programs work with addition, subtraction, multiplication and division of whole numbers, fractions and decimals as well as work with rounding numbers, graph reading, median, mode and multiplication tables.

In Biology classes, the Conduit Program Series: Rhinet and Ecological modeling were received too late in the year to be used, but will be used extensively next year for simulation purposes. In the area of science simulation, two programs were used several times this year. One of the programs, Earthquest (PI, 1979) creates a world in space into which a spacecraft from earth is shipwrecked. The society is similar in many ways, yet different. The task is to repair the ship and return to earth. The other simulation is Three Mile Island by Richard Orban (Muse Software, 1979). This is probably the best science simulation I have seen. The color, graphs, documentation and interest level are very good. The students are quite interested in the realistic nuclear reactor and the challenge to avoid a melt-down.

Two programs used for speeding calculation and checking are Metri-vert (Edu-ware) and Statistics (Edu-ware). These programs do not lend themselves to teaching since the computer does the work and only supplies the user with answers.

In conclusion, I would like to point out that many of the programs arriving late in the year were unfamiliar to some of our faculty. Therefore, I see even more and better use of the programs in the coming years as East Carteret computer equipment facilities grow.

Reginald Baker

TITLE: DEVELOPMENT OF AN INTRODUCTORY MINI-COURSE IN COMPUTER SCIENCE

I. INTRODUCTION

II. SUMMARY

III. OBJECTIVES

IV. BIBLIOGRAPHY

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- B. COMPUTER COURSEWARE
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- A. TIME LINE
- B. ACTIVITIES

VI. EVALUATION AND EXTENSION

VII. SAMPLE PROGRAM - FINAL EXAM

I. Introduction

This report outlines the development of an introductory experience with microcomputers. The outline includes a synopsis of the events involved in organizing, funding, executing, and evaluating an initial course in computer science. We have included objectives of the course, a bibliography of the hardware, software, books, and other materials that were evaluated and/or selected for the course, a summary of the class activities, copies of sample programs, and our intentions for expansion of an initial course.

II. Summary

See enclosed progress report.

III. Objectives

1. The student will know basic computer concepts.
   a. Historical highlights of computer development.
   b. Appearance and basic design of digital computers.
   c. Names and major characteristics of various computer languages.
2. The student will be able to use a microcomputer.
   a. Students will learn key terms: BASIC BIT, BYTE, K, RAM, ROM, CPU, I/O, Z-80, MICROPROCESSOR, etc., common to ALL microcomputers.
   b. Students will learn to do arithmetic operations: +, -, x, ÷.
   c. Students will learn to enter, run, and edit previously designed programs written in BASIC language.
   d. Students will learn to use the different types of BASIC language, such as Level I, Level II, Disc, Basic, and be able to explain or use statements such as PRINT, RUN, LIST, INPUT, EDIT, SAVE, etc.

3. The student will learn elementary programming techniques.
   a. Student will observe and construct flowcharts.
   b. Student will experiment with recognition and elimination of errors in programs.
   c. Student will be able to write, enter, store, retrieve, and edit original programs written in BASIC language.
4. The student will learn how to use Loops and Subroutines.
   a. The student will learn to use statements, such as GOTO, IF-THEN, FOR-NEXT-STEP.
   b. The student will learn to execute subroutines with statements, such as GOSUB.

IV. Bibliography

The following materials were evaluated for purchase and were included in the curriculum design for our computer course. Although there is a wealth of material available, we tried to review and select materials that were structured in short, simply written, clearly labeled units. We felt introductory materials must be highly interesting and easy to apply to any of the course objectives.

For convenience we have included the name of the material, the type of material, and where it can be obtained.

1. Books

BASIC Computer Programming - Radio Shack
BASIC Computer Games - Radio Shack
Computer Dictionary and Speller - Prentice Hall, Inc.
Level II Programming - Radio Shack
Level II Programming Techniques - Radio Shack
TRS-80 Graphics - Radio Shack
Peanut Butter & Jelly Guide to Computers - Dilithium Press
TRS-80 Programs - Radio Shack
Level I Reference Manual - Radio Shack
Level II Reference Manual - Radio Shack
TRSDOS Reference Manual - Radio Shack
Computer Quiz Book - Camelot Publishing
Using BASIC in the Classroom - Camelot Publishing
BASIC - A Unit for Secondary Schools (2nd edition) - Camelot Publishing

2. Computer Courseware

This group of materials includes multi-media kits as well as actual programs written and stored on a tape cassette or an electro-magnetic disc. Many of the programs are mathematical in nature in that the format may be a game or puzzle requiring a creative, systematic, logical solution but not necessarily a purely mathematical calculation.

These materials give the student a stimulating challenge in a form that he can understand and enjoy while he is learning. Even at the most elementary level of computer literacy, the student can experience positive hands-on participation and application of concepts he has learned by the use of computer courseware programs.

Advanced Graphics - Plotting Algebraic Equations - Radio Shack
Level II BASIC, Part I - Self-Instruction - Radio Shack
Course in BASIC (Tape)
Level II BASIC, Part II - Self-Instruction - Radio Shack
(Tape)
Disc BASIC Instruction - Self-Instruction - Radio Shack
(Disc)
Part I: Introduction to BASIC - A Multi-Media - Radio Shack
Kit including transparencies, student workbooks, teacher manuals, program tapes
IQ Builder - Language and number skills - Radio Shack
Microchess - Chess game on 3 levels of difficulty - Radio Shack
Haunted House - Creative problem solving exercise - Radio Shack
Micro movie - Graphics use of the computer in producing visual images - Radio Shack
Pyramid - Problem in a game format requiring deductive and logical thinking - Radio Shack
Quick Watson - Sherlock Holmes mystery deductive exercise - Radio Shack
Budget Management - A personal finance aide for teaching students how to handle business matters - Radio Shack
Scriptsit - A tool for processing data - Radio Shack
Tiny PASCAL - An introduction to programming using the PASCAL language instead of BASIC - Radio Shack
Library 100* - A collection of 100 programs in the areas of Education, Finance, Graphics, Home Uses, and Games.
*A best buy in terms of getting the most for your money - Bottom Shelf

3. Magazines and Periodicals

Classroom Computer News - A newsletter-type magazine filled with short articles and programs useful to teachers

Creative Computing - Leading software and creative microcomputer applications publication

TRS-80 Microcomputer News - A newsletter specifically for TRS-80 owners.

The Practitioner - Newsletter publication of the NASSP, Vol. VI, #1, Oct. 1979, contains a wealth of information sources pertaining to exemplary computer instruction programs as well as basic information on purchasing and needs assessment.

The Use of Computers in Instruction in Secondary Schools - A pamphlet giving general information concerning educational, resource, and purchase factors regarding computer instruction - NASSP

4. Sources of Materials and Information

The following are names and addresses of people or companies that are excellent sources of information on computer equipment, courseware, or curricula.

Margaret Bingham*	Instructional Computing Coordinator State Board of Education 116 West Edenton Street Raleigh, NC 27611
Radio Shack Computer Center**	6586 Glenwood Avenue Raleigh, NC 27611
Creative Computing	Box 789-M Morristown, NJ 07960
Stones Southern School Supply	3800 Holly Springs Road Raleigh, NC 27606
Camelot Publishing Company	Box 1357 Ormond Beach, FL 32074
The Bottom Shelf	Box 49104 Atlanta, GA 30359
Conduit (Pipeline)	Box 338 Iowa City, Iowa 52240
Dilithium Press	Box 92 Forest Grove, OR 97116
Prentice-Hall, Inc.	Englewood Cliffs, NJ 07632

*Best single source of information.
**Best single source of materials.

V. Course Topics and Activities

A. Time Line

1st Class - Description of computers
Examples of various languages
Flowcharting
Touch-time

2nd, 3rd Class - Basic operator commands
Lab - Touch-time, computer games

4th Class - Introduction to loops
Review operator commands
Touch-time

5th Class - Complete loops (introduction)
Introduce Arrays
Touch-time

6th Class - Review
Lab - inserting programs, editing, running
Evaluation

7th Class - Independent programming
Individual review of flowcharts, commands, loops, arrays
Touch-time

8th Class - Introduction to subroutines (lecture, discussion)

9th Class - Demonstration of subroutines
Touch-time

10th Class - Using Subroutines (lab)

11th Class - Field trip
ECU Computer Center
ULTRA Project

12th Class - Review of field trip
Review of subroutines
Production of Individual Programs for Evaluation

13th Class - Comparison of BASIC, PASCAL, ALGOL, COBOL, FORTRAN
Continued Production of Individual Programs for Evaluation

14th Class - Exam

B. Activities

Field trips could be utilized to a greater extent provided adequate planning is done to assure that (1) the students are sufficiently sophisticated in computer concepts to understand what they are seeing

and (2) the project, business, or operation being visited uses equipment and processes that reasonably parallel the scope of concepts you are teaching in your course. Many medium-sized businesses or branch operations use small computers for daily input, whereas others use time-sharing with large, sophisticated equipment that is unsuited to novices. It would be desirable to include hands-on experience while visiting a local computerized concern. If the intent of the course is computer literacy and the purpose of computer literacy is improvement of employment skills as well as academic knowledge, then actual experience with a known commercial computer need would be desirable.

Field trips should be used late in the course after the student has developed some knowledge. If a visitor, preferably a programmer from the place to be visited, could come to the class prior to the field trip, many questions could be answered.

Often permission to observe some computer operations must be secured well in advance due to periodic maintenance, business reports, and timing of data needs, and availability of suitable personnel. Our class visited a research project that intends to develop convenient communications equipment for visually handicapped persons. Innovative, as well as practical, uses of computers are legitimate purposes of field trips for introductory students.

VI. Evaluation and Extension

We found our course effective under the following conditions:

1. There is adequate time to allow individual experience of each concept.
2. There is a policy of free access to equipment for students taking such a course.
3. There are structured evaluations.
4. The student-teacher-computer ratio is reasonably close to 5:1:1/hour of teaching time.

5. There is an interrelationship between computer studies and the major curriculum areas in the school.

6. There are adequate materials to allow success on all levels from the first day a student contacts a computer.

7. There is an ongoing attempt to explore the uses of the computer in the total school program from the administration, to the curriculum, to individual classroom management.

The future uses of computers as a result of our initial experience include the utilization of inhouse computer scheduling, the development of a math lab centered around our computers, and the expansion of our business curriculum to include the basics of data processing.

VII. Sample Program - Final Exam

This program was written to evaluate the students' basic computer literacy. We would emphasize that this test evaluates minimum competencies which every student should be able to demonstrate at the conclusion of a course such as this. The complete final exam should include additional evaluation tailored to the individual abilities and learning rates of the students involved.

The fact that part of the minimum evaluation requires the student to recall and print out the actual evaluation instrument indicates that actual hands-on operation time as well as exposure to factual concepts is necessary.

Sample program will be found on pages 8 and 9.

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Curriculum Coordinator
Washington High School
Washington, North Carolina 27889

```
10 REM ************************************************************
20 REM
30 REM                  F I N A L   E X A M
40 REM
50 REM ************************************************************
60 REM -- DECEMBER 17, 1980
70 REM
80 REM  VARIABLES:  N1 --  THE NUMBER OF TEST QUESTIONS
90 REM              N2 --  THE NO. OF LINES IN CURRENT QUESTION
100 REM             L$ --  CURRENT LINE OF QUESTION
110 REM             S1 --  NUMBER OF LINES TO SKIP FOR ANSWER
120 REM
130 REM ************************************************************
140 REM   PRINT STATEMENTS ARE AT 1002, 1030, 1035AND 1070
150 REM   IN CASE CHANGING THEM IS NECESSARY.
200 READ N1
210 FOR I=1 TO N1
220 GOSUB 1000
230 NEXT I
240 END
1000 READ N2
1002 LPRINT I;".";TAB(7);
1010 FOR J=1 TO N2
1020 READ L$
1030 LPRINT L$
1035 LPRINT TAB(7);
1040 NEXT J
1050 READ S1
1060 FOR J=1 TO S1
1070 LPRINT " "
1080 NEXT J
1090 RETURN
9000 REM
9010 REM  THE DATA SHOULD BE ARRANGED AS FOLLOWS:
9020 REM       ITEM 1 SHOULD BE THE NUMBER OF TEST QUESTIONS
9030 REM       ITEMS 2 - ??  SHOULD EACH BE A "QUESTION SET"
9040 REM             IN WHICH EACH "QUESTION SET" LOOKS LIKE
9050 REM             THIS --> 10010 DATA 2
9060 REM                      10020 DATA "WHO WON THE"
9070 REM                      10030 DATA "       CIVIL WAR?"
9080 REM                      10040 DATA 1
9090 REM  SPECIFICALLY, THE FIRST LINE OF THE QUESTION SET
9100 REM  SHOULD CONTAIN THE NUMBER OF LINES USED BY THE
9110 REM  QUESTION TEXT.  THE SECOND LINE OF THE QUESTION SET
9120 REM  SHOULD CONTAIN THE FIRST LINE OF THE QUESTION TEXT.
9130 REM  NEXT SHOULD FOLLOW AS MANY LINES AS ARE NEEDED TO
9140 REM  COMPLETE THE QUESTION.  THE LAST LINE OF THE
9150 REM  QUESTION SET SHOULD CONTAIN THE NUMBER OF LINES TO
9160 REM  SKIP BEFORE PRINTING THE NEXT QUESTION ( I.E. THE
9170 REM  NUMBER OF BLANK LINES TO LEAVE FOR THE ANSWER ).
9180 REM
9999 REM  LINE 10000 SHOULD HAVE THE NUMBER OF QUESTIONS...
10000 DATA 10
10010 DATA 1
```

```
10020 DATA "WRITE A BASIC STATEMENT TO PRINT YOUR NAME."
10030 DATA 3
10040 DATA 1
10050 DATA "WRITE A BASIC STATEMENT TO PRINT YOUR AGE."
10060 DATA 3
10070 DATA 5
10080 DATA "WRITE ONE OR MORE BASIC STATEMENTS TO PRINT"
10090 DATA "THE NUMBER OF MONTHS YOU HAVE BEEN ALIVE."
10100 DATA "(USE ONLY YOUR AGE, ROUNDED TO THE NEAREST YEAR,"
10110 DATA "MULTIPLIED BY TWELVE, SINCE THERE ARE TWELVE"
10120 DATA "MONTHS IN A YEAR.)"
10130 DATA 5
10140 DATA 2
10150 DATA "WRITE A STATEMENT TO PRINT THE SQUARE ROOT OF PI."
10160 DATA "(HINT:  PI IS EQUAL TO 3.141592)"
10170 DATA 3
10180 DATA 2
10190 DATA "WRITE A LOOP WHICH PRINTS THE NUMBERS FROM"
10200 DATA "1 TO 10.  BE SURE TO PRINT THE NUMBERS."
10210 DATA 6
10220 DATA 2
10230 DATA "WRITE A LOOP WHICH COUNTS FROM 10 DOWN TO 1."
10240 DATA "BE SURE TO PRINT THE NUMBERS."
10250 DATA 6
10260 DATA 4
10270 DATA "WRITE A LOOP WHICH PRINTS THE EVEN NUMBERS BETWEEN"
10280 DATA "1 AND 20.  THAT IS, THE LOOP SHOULD COUNT BY TWO'S"
10290 DATA "STARTING AT 2 AND COUNTING UP TO 20."
10300 DATA "HINT:  YOU GOTTA USE THE 'STEP' PART OF THE LOOP."
10310 DATA 6
10320 DATA 3
10330 DATA "WRITE THE BASIC STATEMENT WHICH TELLS THE COMPUTER"
10340 DATA "HOW BIG AN ARRAY CALLED 'A' IS.  (YOU CAN MAKE THE"
10350 DATA "ARRAY ANY SIZE YOU LIKE.)"
10360 DATA 3
10370 DATA 13
10380 DATA "WHAT DOES THIS PROGRAM DO?"
10390 DATA "        10 DIM N(10)"
10400 DATA "        20 N(1)=4"
10410 DATA "        30 N(2)=8"
10420 DATA "        40 N(3)=2"
10430 DATA "        50 N(4)=5"
10440 DATA "        60 N(5)=9"
10450 DATA "        70 S=0"
10460 DATA "        80 FOR I=1 TO 5"
10470 DATA "        90 S=S+N(I)"
10480 DATA "       100 NEXT I"
10490 DATA "       110 PRINT S"
10500 DATA "       120 END"
10510 DATA 10
10520 DATA 5
10530 DATA "IF WE WERE TO INSERT A THE FOLLOWING LINES INTO"
10540 DATA "THE PROGRAM IN THE PREVIOUS PROBLEM, WHAT WOULD"
10550 DATA "THE PROGRAM DO?"
10560 DATA "       112 A=S/5"
10570 DATA "       114 PRINT A"
10580 DATA 10
```

WASHINGTON CITY SCHOOLS

WASHINGTON, NORTH CAROLINA

PROGRESS REPORT ON GIFTED & TALENTED MINIGRANT FOR CURRICULUM DEVELOPMENT

The following report briefly outlines our first experience with a program development minigrant. The fact that we proposed, developed, executed, and evaluated a program in less than 90 days has also been an "interesting" experience. The major focus of our program was to introduce computer awareness and literacy into our curriculum in a manner that would be most convenient for our target audience and least disruptive to our normal schedule. This concept of student and administrative convenience was necessary since our regular scheduling had long since occurred and was being implemented prior to this minigrant proposal.

The impetus for our proposal lay in the initiative of our local board in allocating funds in the 1980-81 budget for the purchase of computer hardware and materials. Further interest developed as a result of workshops conducted by the Regional Center in Williamston during August. At this point we decided to purchase equipment and to attempt an introduction to computer literacy for our 1980-81 student body.

Our major problem, and quite frankly the real need for the minigrant, was the lack of a qualified instructor. We have no one presently on staff who could do the job and funds were needed to recruit a suitable instructor. After defining our target audience and setting up a student population projection, we were able to recruit three prospects for the instructor's position. An individual from East Carolina University was hired and our class began on October 30, 1980 at 3:30 p.m.

The class, which was named "Introduction to Computers", met twice a week until December 18, 1980. Each class was two to two and one-half hours long for a total instructor contact time of forty hours. Additional time was set aside daily during our lunch/activity period for those students in the class to participate in hands on interaction with the computers. No one else was allowed access to the computer room during this initial phase of our program. Our computer class benefited greatly from this daily contact which escalated the total contact time to eighty hours during the period from October 30 to

December 18, 1980. We feel the daily reinforcement was essential in the successful completion of our short but intense program in computer awareness.

At the end of the time set aside for formal classes, an exam was given to the students one at a time. The exam was written and programmed into the computer by the instructor so that the student did not need an instructor to take the exam. The student had to demonstrate mechanical as well as academic input to achieve a satisfactory result. At the completion of the exam, a printout was produced that told the student how well he had achieved his goal of computer literacy.